REMARKS/ARGUMENTS

Favorable reconsideration of this application is respectfully requested.

Claims 1-60 are pending in this application, Claims 1-7, 10-20, 23-33, 36-46, and 49-55 being presently active in this application, Claims 8, 9, 21, 22, 34, 35, 47, 48, and 56-60 having been withdrawn from consideration as directed to non-elected species.

In the outstanding Office Action, Claim 17 was objected to as including informalities requiring correction. Claims 16, 29, 42, and 55 were rejected under 35 USC §112, second paragraph. Claims 1-4, 6, 7, 10-13, 16, 17, 19, 20, 23-26, 29, 43, 45, 46, 49-52, and 55 were rejected under 35 USC §102(b) as anticipated by U.S. Patent 6,008,520 to Darwish et al. (herein "Darwish '520"). Claims 5, 18, and 44 were rejected under 35 USC §103(a) as unpatentable over Darwish '520 in view of U.S. Patent Application Publication No. 2003/0235959 to Lichtenberger et al. (herein "Lichtenberger"). Claims 14, 15, 27, 28, 53, and 54 were rejected under 35 USC §103(a) as unpatentable over Darwish '520 in view of U.S. Publication No. 2004/0070028 to Azam et al. (herein "Azam"). Claims 30, 32, 33, 36-39, and 42 were rejected under 35 USC §103(a) as unpatentable over Darwish '520 in view of U.S. Patent No. 6,600,193 to Darwish (herein "Darwish '193"). Claim 31 was rejected under 35 USC §103(a) as unpatentable over Darwish '520 and Darwish '193 as applied to Claim 30, and further in view of Lichtenberger. Claims 40 and 41 were rejected under 35 USC §103(a) as unpatentable over Darwish '520 and Darwish '193 as applied to Claim 30, and further in view of Azam.

Addressing first the objection to Claim 17, Claim 17 is amended by the present response as suggested in the Office Action to address the objection thereto.

Addressing now the rejection of Claims 16, 29, 42, and 45 under 35 U.S.C. § 112, second paragraph, that rejection is traversed by the present response. Each of Claims 16, 29, 42, and 45 is now amended to depend from respective dependent Claims 12, 25, 38, and 51, as suggested in paragraph 3 of the Office Action. The claim amendments are believed to address the rejections under 35 U.S.C. § 112, second paragraph.

Addressing now the rejection of Claims 1-4, 6, 7, 10-13, 16, 17, 19, 20, 23-26, 29, 43, 45, 46, 49-52, and 55 under 35 U.S.C. § 102(b) as anticipated by Darwish '520, and the rejection of Claims 30, 32, 33, 36-39, and 42 under 35 U.S.C. § 103 as unpatentable over Darwish '520 in view of Darwish '193, those rejections are traversed by the present response.

With respect to independent Claim 1, applicants respectfully submit Darwish '520 does not disclose the features:

> a fourth semiconductor layer of the first conductivity type formed ***near the trench on an interface between the first and second semiconductor layers*** and having an impurity concentration higher than that of the first semiconductor layer;
>
> wherein an impurity concentration profile of the second semiconductor layer has a first peak which determines at least threshold voltage and a ***second peak which determines a dose amount of the impurities***. [Emphasis added.]

With reference to Figure 1 in the present specification as a non-limiting example, a fourth semiconductor layer 27 is formed "near the trench at an interface between the first and second semiconductor layers". Applicants respectfully submit Darwish '520 does not disclose such a feature.

The Office Action cites delta layer 402 in Darwish '520 as corresponding to the claimed "fourth semiconductor layer". As shown for example in Figure 4 of Darwish '520 that delta layer 402 is provided in contact with the side wall of the trench, and is not formed "near the trench on an interface between the first and second semiconductor layers" as in the claims.

With the claimed structure of the fourth semiconductor layer as noted above, in the claimed semiconductor device it is possible to control at high accuracy the length of the channel region generated from the source region 23 to be equal to the length of the trench 24.

The delta layer 402 in Darwish '520 does not have the structure of the claimed "fourth semiconductor layer", and cannot achieve results of that claimed "fourth semiconductor layer".

Further Darwish '520 does not does not disclose or suggest the "second peak which determines a dose amount of the impurities". Such a claim structure provides the benefit of preventing depletion.

In such ways, independent Claim 1, and the claims dependent therefrom, are believed to distinguish over Darwish '520.

With respect to independent Claim 17, Darwish '520 as noted above does not disclose features of the "fourth semiconductor layer of the first conductivity type formed near the trench on an interface between the first and second semiconductor layers".

Further, applicants respectfully submit Darwish '520 does not disclose "wherein an impurity concentration profile of the second semiconductor layer has a peak in a portion near an interface between the second and fourth semiconductor layers", as also recited in independent Claim 17. With such a structure of having a peak in a portion near an interface between the claimed second and fourth semiconductor layers, a shape similar to a BOX shape can be attained. As a result an ON-resistance can be reduced and the switching characteristics can be enhanced.[1]

In such ways, independent Claim 17, and the claims dependent therefrom, are believed to distinguish over Darwish '520.

With respect to independent Claim 30, applicants note the rejection thereto is based on Darwish '520 in view of Darwish '193, but applicants respectfully submit Claim 30 distinguishes over that combination of teachings.

---

[1] See for example the present specification at page 12, line 17 et seq.

With respect to independent Claim 30, independent Claim 30 recites "wherein a region of not less than 60% of the second semiconductor layer has at least 40% of the maximum value of the impurity concentration of the second semiconductor layer". As also noted in the present specification on page 12, with such a structure a shape similar to the BOX shape can be obtained, and again thereby the ON resistance can be reduced and the switching characteristics can be maintained. Such a feature is neither taught nor suggested by Darwish '520 or Darwish '193, and neither Darwish '520 nor Darwish '193 teach or suggest a structure realizing the above advantages.

In such ways, independent Claim 30, and the claims dependent therefrom, are believed to distinguish over Darwish '520 in view of Darwish '193.

With respect to independent Claim 43, independent Claim 43 is amended by the present response to now recite:

> wherein the relation $0.18 < X1/X2 < 0.25$ is set up when the minimum width of a repetition interval of elements is set at X2 [μm] and a distance between regions of the second semiconductor layer which face each other to sandwich the trench is set at X1 [μm].

The above-noted range is not disclosed or suggested by Darwish '520, which was cited with respect to such features.

Further, as shown for example in Figure 5 in the present specification, by maintaining the ratio (X1/X2) in the range of $0.18 < X1/X2 < 0.25$, the values of the ON resistance Ron and gate-drain feedback capacitance Qgd are kept small. Therefore, in that range of $0.18 < X1/X2 < 0.25$, the ON resistance and gate-drain feedback capacitance can be reduced.

Darwish '520 does not disclose or suggest such a structure or realizing such advantages as in the claimed structure.

In such ways, independent Claim 43, and the claims dependent therefrom, are believed to clearly distinguish over Darwish '520.

Each of the above-noted further grounds for rejection are based on the above-noted teachings of Darwish '520 and Darwish '193 and cite the additional secondary references to Lichtenberger and Azam. However, the teachings in Lichtenberger and Azam cannot overcome the above-noted deficiencies of Darwish '520, or Darwish '520 in view of Darwish '193. Thus, the further rejections are also traversed by the present response.

In view of the present response, applicants respectfully submit each of independent Claims 1, 17, 30, and 43, and the claims dependent therefrom, are allowable.

Moreover, with respect to withdrawn Claims 8, 9, 21, 22, 34, 35, 47, 48, and 56-60, applicants note that of those claims, Claims 8 and 9 depend on independent Claim 1, Claims 21 and 22 depend on independent Claim 17, Claims 34 and 35 depend on independent Claim 30, and Claims 47 and 48 depend on independent Claim 43. As discussed above, each of independent Claims 1, 17, 30, and 43 is believed to be allowable, and are respectively generic to withdrawn Claims 8, 9, 21, 22, 34, 35, 47, and 48. Thus, each of withdrawn Claims 8, 9, 21, 22, 34, 35, 47, and 48 should be properly reinstated and are also allowable.

As no other issues are pending in this application, it is respectfully submitted that the present application is now in condition for allowance, and it is hereby respectfully requested that this case be passed to issue.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Surinder Sachar

Eckhard H. Kuesters
Attorney of Record
Registration No. 28,870

Surinder Sachar
Registration No. 34,423

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 06/04)

I:\ATTY\SNS\24'S\243808\243808US-AM.DOC